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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
BROCK II, PAUL E

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 08/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/328,391	Applicant(s) BERGER ET AL.
	Examiner Paul E Brock II	Art Unit 2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) *4,5,7-10,16,17 and 19-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6,11-15,18,23 and 24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Claims 4, 5, 7 – 10, 16, 17 and 19 – 22 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 11.

Specification

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: It is not clear where in the originally filed specification support for "wherein a thickness of the transfer barrier layer is at least ten times greater than a thickness of the quantum well" can be found.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1 – 3, 6, 11 – 15, 18, 22, and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification support for "wherein a thickness of the transfer barrier layer is at least ten times greater than a thickness of the quantum well" can be found. While the applicant points out an example in the specification where a thickness of the transfer barrier layer is 16.7 times greater than the thickness of the quantum well for support of "at least ten times greater," one example does not constitute support for a range.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 3, 11, 13, 14, 15 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencher et al. (USPAT 5086327, Rosencher) in view of Snow (USPAT 5510627) and Katoh (USPAT 5041882).

With regard to claim 1, Rosencher discloses in figure 3 an electromagnetic wave detector. Rosencher discloses in figure 3 a stack of layers made of III-V semiconductor materials.

Rosencher discloses in figure 3 a conduction band profile of the materials defining at least one quantum well (3), the quantum well having at least one first discrete energy level populated with electrons that are capable of passing to a second energy level under absorption of an electro magnetic wave. Rosencher discloses in figure 3 means for counting the electrons in the second energy level. Rosencher discloses in figure 3 wherein the stack of layers of semiconductor materials furthermore comprises a transfer barrier layer (4), and an electron storage layer (5) separated from the quantum well by the transfer barrier layer. Rosencher discloses in figure 4 wherein a thickness of the transfer barrier layer is at least one order of magnitude greater than a thickness of the quantum well. Rosencher does not teach wherein a thickness of the transfer barrier layer is at least ten times greater than a thickness of the quantum well. Snow teaches in column 2, lines 39 – 52 wherein a thickness of a transfer barrier layer (500 angstroms) is at least ten times greater than a thickness of a quantum well (40 angstroms). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the thickness ratio of Snow in the method of Rosencher in order to increase the sensitivity of the electromagnetic detector as stated by Snow in column 2, lines 39 – 52. Rosencher discloses in figure 3 wherein a lowest energy level of a conduction band of the transfer barrier layer being greater than the lower energy levels of the quantum well and the electron storage layers. Rosencher and Snow do not teach that the conduction band profile of the stack of layers of semiconductor materials decreases from the quantum well to the electron storage layer. Katoh teaches in column 3, lines 37 – 48 a lower energy level of a conduction band profile of a stack of layers of semiconductor materials decreases from a quantum well to a electron storage layer so as to further a flow of electrons from the second energy level to the electron storage layer. It would have been obvious to one of

ordinary skill in the art at the time of the present invention to use the transfer barrier layer with a decreasing lower energy level of its conduction band of Katoh in the method of Rosencher and Snow in order to establish an electron accelerating electric field within the barrier layer as stated by Katoh in column 3, lines 37 – 48.

With regard to claim 2, Rosencher discloses in figure 3 wherein the stack of layers made of III-V semiconductor materials furthermore comprises a first barrier layer (2) and a third barrier layer (6), both of the first and third layers being made of semiconductor materials such that a lowest energy level of a conduction band of the both layers is respectively greater than a lowest energy level of the conduction band of the quantum well and of the electron storage layer.

With regard to claim 3, Katoh discloses in column 3, lines 37 – 48 wherein a decreasing profile of the lowest energy level of the conduction band of the transfer barrier layer is obtained with a semiconductor alloy having a composition varying from the quantum well to the electron storage layer.

With regard to claim 11, Rosencher teaches in the abstract the electromagnetic wave detector further comprising means for resetting the flow of the electrons in the storage layer.

With regard to claim 13, Rosencher discloses in figure 3 an electromagnetic wave detector. Rosencher discloses in figure 3 a stack of layers made of III-V semiconductor materials. Rosencher discloses in figure 3 a conduction band profile of the materials defining at least one quantum well (3), the quantum well having at least one first discrete energy level populated with electrons that are capable of passing to a second energy level under absorption of an electro magnetic wave. Rosencher discloses in figure 3 a counting unit configured to count the electrons in the second energy level. Rosencher discloses in figure 3 wherein the stack of

layers of semiconductor materials furthermore comprises a transfer barrier layer (4), and an electron storage layer (5) separated from the quantum well by the transfer barrier layer. Rosencher discloses in figure 4 wherein a thickness of the transfer barrier layer is at least one order of magnitude greater than a thickness of the quantum well. Rosencher does not teach wherein a thickness of the transfer barrier layer is at least ten times greater than a thickness of the quantum well. Snow teaches in column 2, lines 39 – 52 wherein a thickness of a transfer barrier layer (500 angstroms) is at least ten times greater than a thickness of a quantum well (40 angstroms). It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the thickness ratio of Snow in the method of Rosencher in order to increase the sensitivity of the electromagnetic detector as stated by Snow in column 2, lines 39 – 52. Rosencher discloses in figure 3 wherein a lowest energy level of a conduction band of the transfer barrier layer being greater than the lower energy levels of the quantum well and the electron storage layers. Rosencher and Snow do not teach that the conduction band profile of the stack of layers of semiconductor materials decreases from the quantum well to the electron storage layer. Katoh teaches in column 3, lines 37 – 48 a lower energy level of a conduction band profile of a stack of layers of semiconductor materials decreases from a quantum well to a electron storage layer so as to further a flow of electrons from the second energy level to the electron storage layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the transfer barrier layer with a decreasing lower energy level of its conduction band of Katoh in the method of Rosencher and Snow in order to establish an electron accelerating electric field within the barrier layer as stated by Katoh in column 3, lines 37 – 48.

With regard to claim 14, Rosencher discloses in figure 3 wherein the stack of layers made of III-V semiconductor materials furthermore comprises a first barrier layer (2) and a third barrier layer (6), both of the first and third layers being made of semiconductor materials such that a lowest energy level of a conduction band of the both layers is respectively greater than a lowest energy level of the conduction band of the quantum well and of the electron storage layer.

With regard to claim 15, Katoh discloses in column 3, lines 37 – 48 wherein a decreasing profile of the lowest energy level of the conduction band of the transfer barrier layer is obtained with a semiconductor alloy having a composition varying from the quantum well to the electron storage layer.

With regard to claim 23, Rosencher teaches in the abstract the electromagnetic wave detector further comprising means for resetting the flow of the electrons in the storage layer.

7. Claims 6, 12, 18 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencher, Snow, and Katoh as applied to claim 1 above, and further in view of Nanbu (JPPAT 361054673).

With regard to claims 6 and 18, Rosencher, Snow, and Katoh do not teach that first and second ohmic contacts are located at the electron storage layer. Nanbu discloses in the Constitution section and figure 1 a first (4) and second (5) ohmic contacts, both of the first and second ohmic contacts being located at an electron storage layer (10) so as to carry out a measurement of photocurrent in a plane of the storage layer. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the ohmic contacts of Nanbu

in the device of Rosencher, Snow, and Katoh in order to stably realize electron mobility as stated by Nanbu in the abstract portion of the English translation.

With regard to claims 12 and 24, Nanbu discloses in figure 1 that the third and fourth contacts are located on either side of a stack of layers of semiconductor materials.

Response to Arguments

8. Applicant's arguments filed June 23, 2003 have been fully considered but they are not persuasive.

9. With regard to the applicant's arguments that "none of the applied art teaches or suggests a thickness of a transfer barrier layer is at least one order of magnitude greater than a thickness of a quantum well," it should be noted that this limitation no longer exists in the claims. Further, as discussed previously in at least the office actions dated October 7, 2002 and February 21, 2003, Rosencher does disclose that a thickness of a transfer barrier layer is at least one order of magnitude greater than a thickness of a quantum well. Therefore, the applicant's arguments are not persuasive, and the rejection is proper.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
August 6, 2003